

# *annals of* NUCLEAR ENERGY

---

Volume 21

1994

## List of Contents and Author Index

### *Executive Editors*

**M. M. R. Williams**

University of London, U.K.

**L. E. Weaver**

Florida Institute of Technology, Melbourne, U.S.A.



Pergamon

---

---

**EXECUTIVE EDITORS**

**L. E. WEAVER**

*President, Florida Institute of Technology,  
150 W. University Boulevard, Melbourne,  
FL 32901-6988, U.S.A.*

**M. M. R. WILLIAMS**

*University of London,  
London, U.K.*

**ADVISORY EDITORS**

F. W. ALBAUGH, *Richland, U.S.A.*

P. L. AUER, *Ithaca, U.S.A.*

T. D. BEYNON, *Birmingham, U.K.*

R. A. BONALUMI, *Toronto, Canada*

F. R. FARMER, *Warrington, U.K.*

H. FENECH, *Santa Barbara, U.S.A.*

W. FRANKOWSKI, *Warsaw, Poland*

B. D. GANAPOL, *Tucson, U.S.A.*

A. GANDINI, *Rome, Italy*

W. HAFELE, *Karlsruhe, Germany*

A. A. HARMS, *Hamilton, Canada*

R. A. KARAM, *Atlanta, U.S.A.*

H. KONNO, *Ibaraki, Japan*

D. J. LITTLER, *Pinner, U.K.*

J. MILDA, *Tokai, Japan*

R. R. MOHLER, *Corvallis, U.S.A.*

J. L. MUÑOZ-COBO, *Valencia, Spain*

R. L. MURRAY, *Raleigh, U.S.A.*

D. OKRENT, *Los Angeles, U.S.A.*

A. E. PARSHAKOV, *Kiev, Ukraine*

A. M. PERRY, *Oak Ridge, U.S.A.*

H. RIEF, *Ispra, Italy*

W. ROTHENSTEIN, *Haifa, Israel*

D. C. SAHNI, *Bombay, India*

A. SCHNEIDER, *Atlanta, U.S.A.*

B. I. SPINRAD, *Seattle, U.S.A.*

R. J. J. STAMM'LER, *Gaithersburg, U.S.A.*

D. B. TRAUGER, *Oak Ridge, U.S.A.*

R. E. UHRIG, *Knoxville, U.S.A.*

G. A. WIKHAMMER, *Chalk River, Canada*

---

**Publishing Office**

*(Production Editor: Victoria Charge)*

Elsevier Science Ltd, Bampfylde Street, Exeter EX1 2AH, U.K.

[Tel. Exeter (01392) 51558; Fax (01392) 425370].

**Subscription and Advertising Offices**

*North America:* Elsevier Science Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.

*Rest of the World:* Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, U.K.

[Tel. Oxford (01865) 843000; Fax (01865) 843010]

**Subscription Rates**

Annual Institutional Subscription Rates 1995: North, Central and South America, US\$857.00; Rest of the World, £575.00. Associated Personal Subscription Rates are available on request for those whose institutions are library members. Sterling prices exclude VAT. Non-VAT registered customers in the European Community will be charged the appropriate VAT in addition to the price listed. Prices include postage and insurance and are subject to change without notice.

**Back Issues**

Back issues of all previously published volumes, in both hard copy and microform, are available direct from Elsevier Science offices.

Second class postage paid at NEWARK, NJ. Postmaster send address corrections to *Annals of Nuclear Energy*, c/o Elsevier Science Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.

# LIST OF CONTENTS

## NUMBER 1

- |   |   |
|---|---|
| KAMALA BALAKRISHNAN and<br>ANIL KAKODKAR                                      | 1 Optimization of the initial fuel loading of the Indian PHWR with thorium bundles for achieving full power |
| G. PRABHAKARA RAO and<br>P. K. SARKAR   | 11 Estimation and analysis of neutron skyshine dose from particle accelerators                              |
| I. A. RÁCZ and S. KISS  | 19 Systematic classification and identification of noise spectra using perceptron-based neural networks     |
| B. MONTAGNINI, P. SORAPERRA,<br>C. TRENTAVIZI, M. SUMINI<br>and D. M. ZARDINI | 45 A well-balanced coarse-mesh flux expansion method  |
| <i>Technical Note</i>   |   |
| S. B. DEGWEKER and<br>H. D. PURANDARE   | 55 The anomalous flux profile observed in KAPP-1 during its first approach to criticality                   |
|   | 61 Book Review  |
|   | 63 Press Releases from the NRPB   |
|   | I Guidelines for the preparation of typescripts for direct reproduction                                     |

## NUMBER 2

- |  |   |
|--|---|
| N. S. GARIS and N. G. SJÖSTRAND                  | 67 Eigenvalues for reflecting boundary conditions in one-speed neutron transport theory |
| M. H. BAIK and K. J. LEE                         | 81 Transport of radioactive solutes in the presence of chelating agents                 |
| S. IWASAKI, N. ODANO and<br>K. SUGIYAMA          | 97 Assistance system for nuclear data evaluation in an object-oriented environment      |
| R. ROY, G. MARLEAU, J. TAJMOUATI<br>and D. ROZON | 115 Modelling of CANDU reactivity control devices with the lattice code DRAGON          |
|  | I Guidelines for the preparation of typescripts for direct reproduction                 |

## NUMBER 3

## iii Obituary

- |   |   |
|---|---|
| D. MENEGHETTI and D. A. KUCERA  | 133 Duct-bowing reactivity trends in EBR-II   |
| J. W. MEADOWS, D. L. SMITH,<br>L. R. GREENWOOD, D. W. KNEFF<br>and B. M. OLIVER | 155 Measurement of the $^9\text{Be}(n,2n)^8\text{Be}$ reaction cross<br>section in the $^9\text{Be}(d,n)$ thick-target neutron spectrum |
| OM PAL SINGH, R. HARISH,<br>S. PONPANDI, P. BHASKAR RAO<br>and R. SHANKAR SINGH | 165 Analysis of passive shutdown capability for a loss of<br>flow accident in a medium sized liquid metal fast<br>breeder reactor       |
| DJAMEL E. DJAFRI  | 171 Effect of phonon transfer on the neutron resonance<br>line shape  |
| S. KOSHIZUKA, K. SHIMAMURA<br>and Y. OKA  | 177 Large-break loss-of-coolant accident analysis of a<br>direct-cycle supercritical-pressure light water reactor                       |
| <i>Technical Notes</i>  |   |
| M. KIELKIEWICZ  | 189 Accuracy of the moments method  |
| R. S. MODAK, H. P. GUPTA<br>and V. K. JAIN                                      | 195 A scheme for the evaluation of $\lambda$ -modes of a neutron<br>diffusion equation  |
|   | 201 Corrigendum   |
|   | I Guidelines for the preparation of typescripts for direct<br>reproduction  |

## NUMBER 4

- |   |   |
|---|---|
| TAKAAKI OHSAWA and<br>MASAHARU INOUE      | 207 Analysis of neutron yields and energy spectra from<br>spent molten-salt reactor fuel                                    |
| K. HASHIMOTO, M. HIROSE and<br>T. SHIBATA | 211 Interpretation of positive scram reactivity in the<br>RBMK-1000 reactor   |
| F. C. DIFILIPPO                           | 219 Probability distributions for first neighbor distances<br>between resonances that belong to two different fam-<br>ilies |
| Y. P. MAHLERS                             | 223 Core loading pattern optimization for pressurized<br>water reactors   |
| P. T. KRISHNA KUMAR and<br>J. SOBANADRI   | 229 Estimation of uncertainties in absolute neutron cross-<br>section measurement   |

- SUNG-SIK YU, YUNG-JOON HAH and POONG-HYUN SEONG 235 Quantitative evaluation on design simplification of the chemical and volume control system
- M. MARSEGUERRA and E. ZIO 249 Identification of a line break by a neural network methodology
- Technical Note*
- R. INDIRA and C. R. VENKATASUBRAMANI 259 Optimization of neutron collars for Pu-assay—design capabilities and adequacy of nuclear data
- 263 Current Papers in Nuclear Energy
- I Guidelines for the preparation of typescripts for direct reproduction

## NUMBER 5

- A. SHARMA, S. D. PARANJAPÉ, A. KUMAR and S. R. DWIVÉDI 267 Nonmonotonic variation of the 'C' eigenvalue of the one-speed neutron transport equation in one-dimensional spherical shells
- M. PIMENTA DE ABREU, A. C. MARQUES ALVIM, F. CARVALHO DA SILVA, Z. DUTRA THOME and J. PLANCHARD 277 Neutronics calculations in a restricted region via the alternative pseudo-harmonics method
- LIEM P. H. 281 BATAN-MPASS: a general fuel management code for pebble-bed high-temperature reactors
- T. SUZUDO and Y. SHINOHARA 291 Qualitative analysis of nonlinear power oscillation in NSRR
- L. RUBY and E. ELIAS 303 Satisfying boundary conditions in three dimensions
- G. F. THOMAS and D. H. BARBER 309 Stiffness in radioactive decay chains
- Technical Note*
- RIZWAN-UDDIN 321 Steady-state characteristics based model for centrifugal pump transient analysis
- I Guidelines for the preparation of typescripts for direct reproduction

## NUMBER 6

- |  |     |   |
|--|-----|---|
| T. ŠMUC, D. PEVEC and<br>B. PETROVIĆ     | 325 | Annealing strategies for loading pattern optimization   |
| H. KONNO, W. HAYASHI and<br>Y. SHINOHARA | 337 | Stochastic center manifold dynamics of limit cycle oscillation in power reactors and measures of nuclear reactor stability          |
| JOO HYUN PARK and<br>POONG HYUN SEONG    | 357 | Nuclear power plant pressurizer fault diagnosis using Fuzzy Signed-Digraph and spurious faults elimination methods                  |
| T. D. BEYNON and R. M. KURIDAN           | 371 | Monte Carlo versus discrete ordinates calculations of the kinetic and coupling parameters of a PWR core with a multi-node reflector |
|  | 383 | Current Papers in Nuclear Energy  |
|  | I   | Guidelines for the preparation of typescripts for direct reproduction   |

## NUMBER 7

- |   |     |  |
|---|-----|--|
| K. E. HOLBERT and<br>B. R. UPADHYAYA                    | 387 | Empirical process modeling technique for signal validation                   |
| G. VERDÚ, D. GINESTAR,<br>V. VIDAL and J. L. MUÑOZ-COBO | 405 | 3D $\lambda$ -modes of the neutron-diffusion equation                        |
| I. PÁZSIT, A. K. PRINJA and<br>N. S. GARIS              | 423 | A note on criticality in the presence of diverging subsystem properties      |
| ANIL K. PRINJA and IMRE PÁZSIT                          | 433 | Some asymptotic slab criticality eigenvalue limits in a discrete angle model |
|   | 383 | Current Papers in Nuclear Energy   |
|   | I   | Guidelines for the preparation of typescripts for direct reproduction        |

## NUMBER 8

- R. AIGLE, G. B. BRUNA and A. SARGENI 445 On the completeness of the multigroup eigenfunctions set of a reactor system Boltzmann operator
- R. L. BUCKLEY and S. K. LOYALKA 461 Numerical studies of solute transport in a fracture surrounded by rock matrix: effect of lateral diffusion and chemical reactions on the overall dispersion
- A. V. CARDONA and M. T. VILHENA 495 A solution of the linear transport equation using Walsh function and Laplace transform
- 507 Book Review
- 509 Current Papers in Nuclear Energy
- I Guidelines for the preparation of typescripts for direct reproduction

## NUMBER 9

- A. O. GOLTSEV, N. E. KUHARKIN, I. S. MOSEVITSKY, N. N. PONOMAREV-STEPNOY, S. V. POPOV, YU. N. UDYANSKY and V. F. TSYBULSKY 513 Concept of a safe tank-type water-water reactor with HTGR micro-particle fuel blocks
- MIHÁLY MAKAI 519 Nodewise analytical calculation of the transfer function
- S. B. DEGWEKER 531 A forward equation of stochastic neutron transport
- M. A. ABDALLA 541 A four-region, moving-boundary model of a once-through, helical-coil steam generator
- V. I. BURYAN and A. V. ZORIN 563 Use of symmetry groups and component analysis for investigation and description of PWR-core physical fields
- Technical Notes*
- G. S. SRINIVASAN and OM PAL SINGH 571 Leak noise detection in steam generator of liquid metal fast breeder reactors using new statistical features
- H. ROUSHDY 579 On the use of a corrected formula for the calculation of the equivalence neutron flux in a heterogeneous lattice cell

## 583 Book Review

- I Guidelines for the preparation of typescripts for direct reproduction

## NUMBER 10

- G. S. BOYKOV, V. D. DMITRIEV,  
G. A. KUDYAEV, V. M. MASLOV,  
YU. B. OSTAPENKO, M. I. SVIRIN and  
G. N. SMIRENKIN 585 Peculiarities in the neutron spectra accompanying  
neutron-induced emission fission of actinide nuclei
- M. G. NA, S. P. KIM, W. K. CHUNG,  
K. J. LEE, J. S. SONG, H. C. NO and  
J. Y. LEE 589 A PC-based water level controller for nuclear steam  
generators
- YASUSHI OKANO, SEI-ICHI KOSHIZUKA 601 Design of water rod cores of a direct cycle super-  
critical-pressure light water reactor
- ANGEL GOMEZ and  
RICARDO WALDMAN 613 A method to reduce space-time effects in the measure-  
ment of reactivities by the rod-drop technique
- A. B. SMITH and P. T. GUENTHER 629 Fast-neutron scattering from vibrational palladium  
nuclei
- P. K. SARKAR and M. A. PRASAD 641 Estimation of computation time in Monte-Carlo  
neutral particle transport with splitting and antithetic  
transformations

*Technical Note*

G. C. BAKOS

- 651 Comparison of build up factors for two energies (1.43  
and 2.75 MeV) photon penetration through double-  
layer shielding slabs
- I Guidelines for the preparation of typescripts for direct  
reproduction

## NUMBER 11

- G. C. BAKOS and N. F. TSAGAS 659 Photon penetration through thick double-layer shield-  
ing slabs
- M. ANTONOPOULOS-DOMIS,  
K. MOURTZANOS and G. POR 667 Study on reactor system identification with multi-  
variate auto-regressive analysis



- M. ANTONOPOULOS-DOMIS,  
M. MARSEGUERRA, K. MOURTZANOS  
and S. TARANTOLA 687 Neutron source localization within sealed tanks
- CYNTHIA FELÍO SEGATTO and  
MARCO TÚLLIO M. B. DE VILHENA 701 Extension of the  $LTS_N$  formulation for discrete  
ordinates problem without azimuthal symmetry
- B. OZGENER and H. A. OZGENER 711 The application of the multiple reciprocity method to  
the boundary element formulation of the neutron  
diffusion equation
- Technical Notes*
- G. C. BAKOS 725 Build up factors for three energies (1.6, 6.13 and  
7.10 MeV) photon penetration through multiple-layer  
shielding slabs
- G. F. THOMAS 729 Accommodating ground water velocity uncertainties  
in the advection-dispersion approach to geologic nuclear  
waste migration
- I Guidelines for the preparation of typescripts for direct  
reproduction

## NUMBER 12

- M. S. VAN DEN BERG 735 A steady flow gaseous core fission reactor
- G. B. BRUNA and A. SARGENI 745 A computational technique for evaluating eigen-  
functions of symmetrical nuclear systems
- I. PÁZSIT and O. GLÖCKLER 759 BWR instrument tube vibrations: interpretation of  
measurements and simulation
- K. BEHRINGER and J. PIÑEYRO 787 Concerning the stability parameter in point reactor  
kinetics driven by random reactivity noise
- Technical Note*
- LAWRENCE RUBY and  
PAUL L. CHAMBRÉ 793 Scattering from a heavy Maxwellian gas
- I Guidelines for the preparation of typescripts for direct  
reproduction

## AUTHOR INDEX

- Abdalla M. A., 541  
 de Abreu M. P., 277  
 Aigle R., 445  
 Alvim A. C. M., 277  
 Antonopoulos-Domis M., 667, 687  
 Baik M. H., 81  
 Bakos G. C., 651, 659, 725  
 Balakrishnan K., 1  
 Barber D. H., 309  
 Behringer K., 787  
 van den Berg M. S., 735  
 Beynon T. D., 371  
 Boykov G. S., 585  
 Bruna G. B., 445, 745  
 Buckley R. L., 461  
 Buryan V. I., 563  
 Cardona A. V., 495  
 Chambré P. L., 793  
 Chung W. K., 589  
 Degweker S. B., 55, 531  
 Difilippo F. C., 219  
 Djafri D. E., 171  
 Dmitriev V. D., 585  
 Dwivedi S. R., 267  
 Elias E., 303  
 Garis N. S., 67, 423  
 Ginestar D., 405  
 Glöckler O., 759  
 Goltsev A. O., 513  
 Gomez A., 613  
 Greenwood L. R., 155  
 Guenther P. T., 629  
 Gupta H. P., 195  
 Hah Y.-J., 235  
 Harish R., 165  
 Hashimoto K., 211  
 Hayashi W., 337  
 Hirose M., 211  
 Holbert K. E., 387  
 Indira R., 259  
 Inoue M., 207  
 Iwasaki S., 97  
 Jain V. K., 195  
 Kakodkar A., 1  
 Kielkiewicz M., 189  
 Kim S. P., 589  
 Kiss S., 19  
 Kneff D. W., 155  
 Konno H., 337  
 Koshizuka S., 177, 601  
 Kucera D. A., 133  
 Kudyayev G. A., 585  
 Kuharkin N. E., 513  
 Kumar A., 267  
 Kumar P. T. K., 229  
 Kuridan R. M., 371  
 Lee J. Y., 589  
 Lee K. J., 81, 589  
 Liem P. H., 281  
 Loyalka S. K., 461  
 Mahlers Y. P., 223  
 Makai M., 519  
 Marleau G., 115  
 Marseguerra M., 249, 687  
 Maslov V. M., 585  
 Meadows J., 155  
 Meneghetti D., 133  
 Modak R. S., 195  
 Montagnini B., 45  
 Mosevitsky I. S., 513  
 Mourtzanos K., 667, 687  
 Muñoz-Cobo J. L., 405  
 Na M. G., 589  
 No H. C., 589  
 Odano N., 97  
 Ohsawa T., 207  
 Oka Y., 177, 601  
 Okano Y., 601  
 Oliver B. M., 155  
 Ostapenko Y. B., 585  
 Ozgener B., 711  
 Ozgener H. A., 711  
 Paranjape S. D., 267  
 Park J. H., 357  
 Pázsit I., 423, 433, 759  
 Petrović B., 325  
 Pevec D., 325  
 Piñeyro J., 787  
 Planchard J., 277  
 Ponomarev-Stepnoy N. N., 513  
 Ponpandi S., 165  
 Popov S. V., 513  
 Por G., 667  
 Prasad M. A., 641  
 Prinja A. K., 423, 433  
 Purandare H. D., 55  
 Rácz I. A., 19  
 Rao G. P., 11  
 Rao P. B., 165  
 Rizwan-uddin, 321  
 Roushdy H., 579  
 Roy R., 115  
 Rozon D., 115  
 Ruby L., 303, 793  
 Sargeni A., 445, 745  
 Sarkar P. K., 11, 641  
 Segatto C. F., 701  
 Seong P.-H., 235, 357  
 Sharma S., 267  
 Shibata T., 211  
 Shimamura K., 177  
 Shinohara Y., 291, 337  
 da Silva F. C., 277  
 Singh O. P., 165, 571  
 Singh R. S., 165  
 Sjöstrand N. G., 67  
 Smirenkin G. N., 585  
 Smith A. B., 629  
 Smith D. L., 155  
 Šmuc T., 325  
 Sobanadri J., 229  
 Song J. S., 589  
 Soraperra P., 45  
 Srinivasan G. S., 571  
 Sugiyama K., 97  
 Sumini M., 45  
 Suzudo T., 291  
 Svirin M. I., 585  
 Tajmouati J., 115  
 Tarantola S., 687  
 Thomas G. F., 309, 729  
 Thome Z. D., 277  
 Trentavizi C., 45  
 Tsagas N. F., 659  
 Tsybulsky V. F., 513  
 Udyansky Yu. N., 513  
 Upadhyaya B. R., 387  
 Venkatasubramani C. R., 259  
 Verdú G., 405  
 Vidal V., 405  
 de Vilhena M. T. M. B., 701  
 Vilhena M. T., 495  
 Waldman R., 613  
 Yu S.-S., 235  
 Zardini D. M., 45  
 Zio E., 249  
 Zorin A. V., 563

